Can Elastic Ankle Exoskeletons Make it Easier for Older Adults to Walk?

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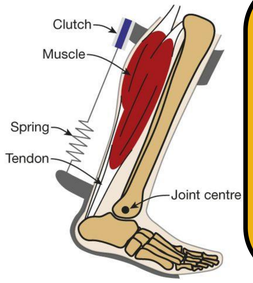
Motivation

Aging leads to slower walking, with less push off, and uses more energy[1,2]

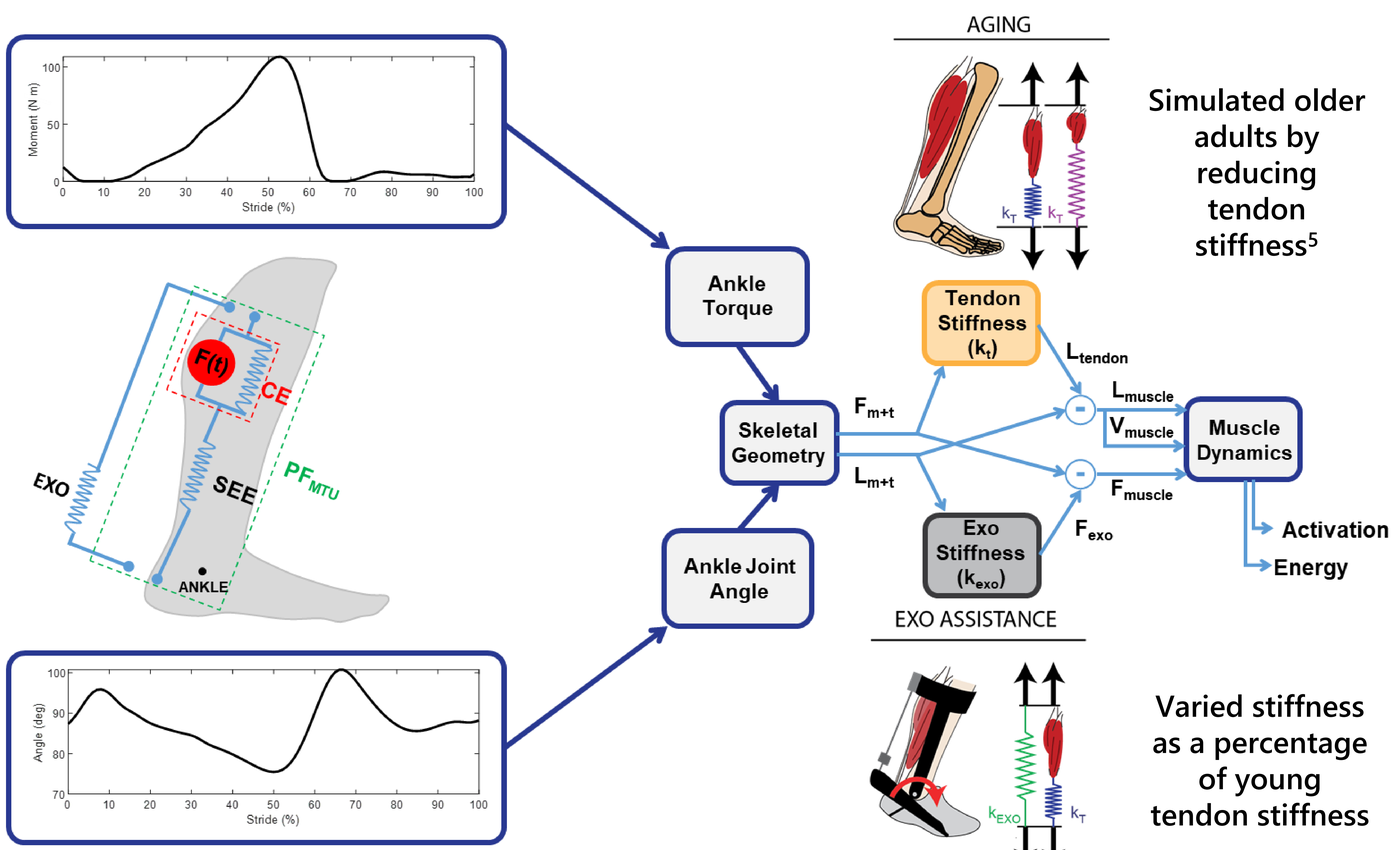
Ankle exoskeletons can provide some push off to the ankle and reduce the energy in young adults[3]



Hypothesis: Elastic ankle exoskeletons can improve walking for older adults comparable to young adults

Approach

A model of the ankle was used to predict how an elastic exoskeleton would modify walking for older adults starting from ankle torque and angles collected from a person[4].



Simulated older adults by reducing tendon stiffness[5]

Varied stiffness as a percentage of young tendon stiffness

Fig. 1 – Block diagram of how the model works

Results and Implications

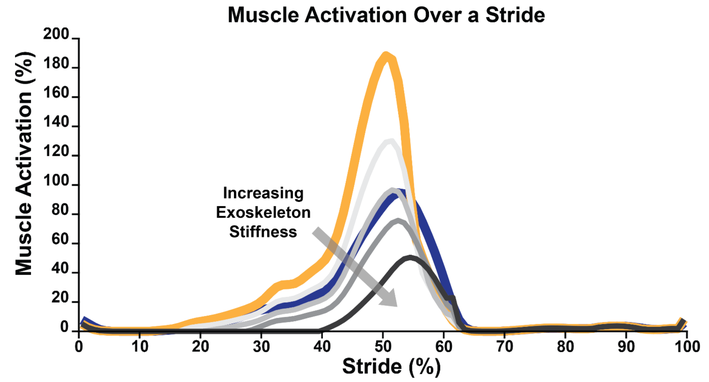


Fig. 2 – Calf muscle activation over a stride

The exoskeleton was able to reduce the activation of the calf muscles which lead to reduced energy used during walking to levels comparable to young adults.

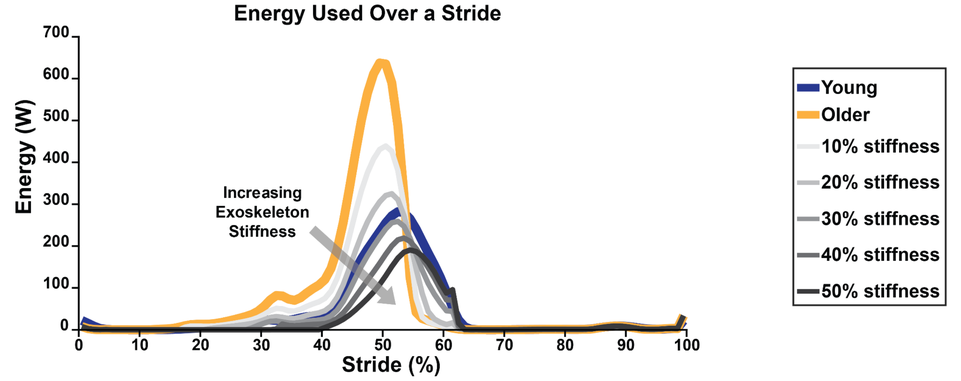
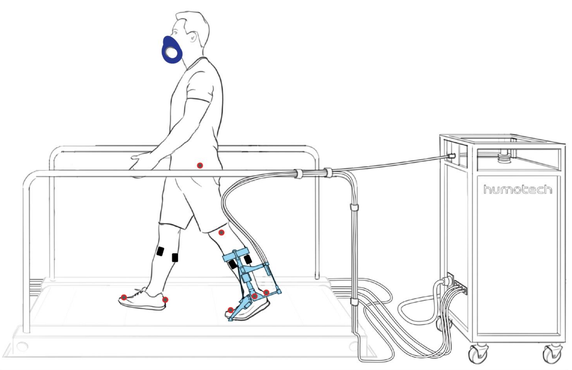


Fig. 3 – Energy used to walk over a stride

Future Directions

Older adults will walk in an elastic exoskeleton while recording ankle angles and torques, muscle activation, and energy used.



Picture modified from HuMoTech website

References

[1] Franz, JR and Kram, R. *Gait Posture* (2014) [2] Ortega, JD and Farley, CT. *J Appl Physiol* (2007) [3] Collins, SH, et al. *Nature* (2015) [4] Sawicki, GS and Khan, NS *IEEE Trans Biomed Eng* (2016) [5] Onambele,GL et al. *J Appl Physiol* (2006)